

3. Ischemic tissues lose their ability to discriminate between dangerous and safe degrees of heat. Nerve structures are very sensitive to a reduction in blood flow. Degenerative changes occur early. The receptor organs for warmth lose their efficiency. A much greater degree of heat is required to stimulate these end organs than would normally be necessary. It is possible for the individual to apply burning degrees of heat to an ischemic extremity without being aware of it.

The reaction of ischemic tissues to injury or infection is likewise affected. Frequently the arterial circulation is so poor that only minimal cellular activity can be maintained. Any additional burden such as that which is required in the healing process of injured or infected tissue cannot be met. This might even be impossible at absolute bed rest. The slightest skin abrasions will result in delayed healing or non-healing. Fungus infections of the toes in the presence of local ischemia are likewise potential sources of non-healing ulcers and gangrene. Caustic preparations for treating ringworm, those containing phenol, benzoic or salicylic acids, are also dangerous. Surgical removal of corns or calluses, or surgical treatment for ingrown toenails, occasionally is followed by serious results. It must also be kept in mind that the process of repair of tissue after injury is altered in the aged. Likewise the resistance of these aging cells to infection is inadequate. This throws an additional burden on an already ischemic tissue.

The following cases which were recently observed are illustrative of the problems involved. The patients were under constant medical care and had been repeatedly cautioned as to the effect of heat, caustics and trauma to the affected extremities.

CASE 1.—A 63-year-old man had arteriosclerosis obliterans with diabetes mellitus of many years' duration. The diabetes was well controlled. The blood sugar levels were usually about 100 mg. per 100 cc. The patient had suffered from severe intermittent claudication for the preceding three years. Acute occlusion of the right femoral artery, apparently on an atheromatous basis, had developed about a year previously. This was followed by an ulcer of the dorsum of the foot which required several months to heal. The ischemic symptoms partially subsided. The patient, who was ambulatory, visited a chiropodist who trimmed his toenails, and signs of early infection in a small abrasion alongside the nail of the right big

toe followed. In spite of intensive therapy with large doses of penicillin, Tyrothricin solution locally, x-ray therapy locally and absolute bed rest, the infection spread, resulting in a painful ulcer of the distal portion of the toe. The big toe soon became completely gangrenous. Two months after the initial trauma, amputation of the leg below the knee was necessary. The wound healed by primary intention.

CASE 2.—The patient, a 60-year-old woman with severe generalized scleroderma, had been under constant observation for over a year, then was lost sight of for five months. On her return she was found to have dry gangrene of the fourth and fifth toes of one foot, with intense pain. She said that she had been under medical care in the interim and that, as her feet were frequently cold, another physician had advised the use of local heat. She then applied an electric pad at low heat. After two or three nights the toes became dark and discolored. The two toes quickly became gangrenous. Within three weeks the distal half of the foot was involved in the gangrenous process. The patient died before surgical operation could be attempted.

CASE 3.—The patient, a woman 64 years of age, had arteriosclerosis obliterans with diabetes mellitus. The diabetes, which was of long standing, was well controlled by diet. Moderate intermittent claudication had been complained of for about two years. There was an acute occlusion of the left femoral artery. The ischemic symptoms subsided in about two months. In getting out of bed, the patient struck the affected foot against the metal side, causing a slight abrasion of the dorsum of the middle toe. This showed no indication of healing, although the rest of the foot was in good condition. After three weeks the area of abrasion suddenly started to show signs of discoloration. The entire toe rapidly became gangrenous, to be followed within a week by the adjoining toes. Within three weeks of the flare-up the distal third of the foot was involved and a mid-thigh amputation became necessary.

In reviewing these cases one cannot definitely state that the gangrenous processes were touched off by traumata. However, as progress had been satisfactory in each case until the time of trauma, by heat, impact or caustic medication, it is felt that the gangrene would not have developed spontaneously.

#### CONCLUSION

Attention is called to the potential dangers of external heat, impact, trauma, infection or caustic medication to ischemic tissues found in peripheral vascular diseases.

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#### Correction

An error was made in a footnote to the article, "The Ber-  
man Foreign Body Locator," by J. P. McBride, M.D.,  
which appeared on page 276 of the October issue of CALI-  
FORNIA MEDICINE. The footnote appeared: "The biplane  
fluoroscope developed by Leishman may also prove to be  
an additional aid in exact location at the time of operation."  
It should have been worded: "The stereoscopic fluoroscope  
developed by Leishman may also prove to be an additional  
aid in exact location at the time of operation."